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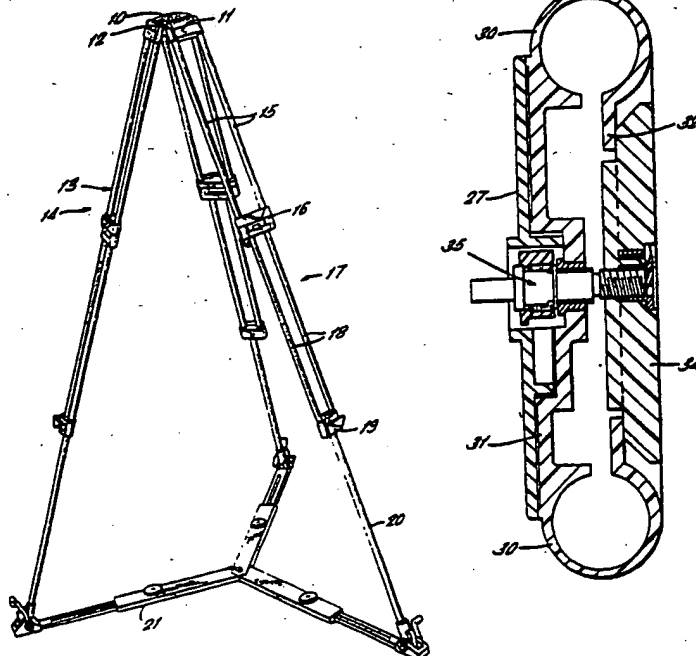
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(21) International Application Number: PCT/GB92/02302 (22) International Filing Date: 11 December 1992 (11.12.92) (30) Priority data: 9126358.2 11 December 1991 (11.12.91) GB (71) Applicant (for all designated States except US): VINTEN GROUP PLC [GB/GB]; Cowdray House, 2-4 High Street, Chalfont St Peter, Gerrards Cross, Buckinghamshire SL9 9QA (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : LINDSAY, Richard, Arthur [GB/GB]; 2 St Mary's Close, Gislegham, Eye, Suffolk IP23 8HW (GB). (74) Agent: BOULT, WADE & TENNANT; 27 Fumival Street, London EC4A 1PQ (GB).		(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published. <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: **IMPROVEMENTS IN OR RELATING TO CLAMPS FOR EXTENDING LEGS**

(57) Abstract

The disclosure relates to a clamp (16) for an extendable leg at least one part (13) of which comprises a pair of parallel circular cross-section members. The clamp comprises a base (22) for mounting on the other part (17) of the leg and having a pair of resilient C-shaped clamping jaws (30) mounted on the base with their axes spaced apart and extending parallel to one another to receive the circular cross-section members (15) forming said one part of the leg. A clamping member (34, 35) is mounted on the base to act on the jaws to close the C-shapes around the members to grip and lock the jaws to the members. The arrangement is particularly suitable for the extendable legs of a tripod for supporting a camera.



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"IMPROVEMENTS IN OR RELATING TO
CLAMPS FOR EXTENDING LEGS"

5 This invention relates to clamps for extending legs.

 The invention is particularly, although not exclusively, applicable to extending legs for tripods
10 for supporting cameras and the like in which each leg has at least two parts which extend with respect to each other, one part carrying a clamp and the other part comprising a pair of circular cross-section members engageable in the clamp to be locked in any
15 position of required extension. Our U.K. Patent Application No. 9114051.7 discloses such a clamp comprising a housing, a first member moveable relative to the housing to affect clamping, torque limiting drive means rotatable in a forward direction
20 relative to the housing to affect the clamping movement of the first member and lost motion stop means rotatable by the drive means into a first stop position relative the housing and into a second stop position spaced angularly from the first stop
25 position as a consequence of reverse rotation of the drive means in which said second stop position continued reverse rotation of the drive means is prevented. This arrangement avoids overtightening of the threaded member of the clamp and also holds the
30 threaded member relatively captive so that it cannot be completely unscrewed.

 With such arrangements, a relatively high clamping torque is required to effect the locking
35 action of the clamp on the two sections.

It is an object of this invention to provide a clamp for a pair of parallel circular cross-section members in which a relatively high clamping force can be achieved with a low clamping torque.

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This invention provides a clamp for an extending leg comprising a base for mounting on one part of the leg and a pair of resilient C-shaped clamping jaws mounted on the base with the axes of the jaws spaced apart parallel to one another to receive a pair of parallel circular cross-section members forming another part of the leg and means on the base acting on the jaws to close the jaws around the members to grip and lock the clamp to the members.

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Preferably the C-shaped jaws are mounted on the base with the open sides of the Cs facing towards each other along the base.

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It is also preferred that the C-shaped jaws are connected together by a bridging member mounted on the base.

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More specifically one end of each of the C-shaped jaws may be formed integrally with the bridging member.

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The other end of each C-shaped clamp may have an outwardly projecting lug and said means to close the C-shaped jaws around the parallel members may act on the projecting lugs.

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An actuating device may be mounted at the centre of the base between the jaws including a clamping member for engaging said lugs of the

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C-shaped jaws and means to draw the clamping member towards the base and thereby close the jaws on the leg members.

5 In accordance with a further feature of the invention the wall thickness of the C-shaped jaws may reduce towards the regions of the jaws adjacent the bridging to provide an increase in flexibility in those regions whereby the jaws are more readily
10 closed on the members extending through the jaws by the action of the clamping member on the jaws.

 In an alternative construction, the C-shaped jaws may be separately mounted on the base, one being
15 fixed to the base and the other being free to float over a limited range of movement with respect to said one jaw to accommodate non-alignment of the pair of members passing through the jaws.

20 The following is a description of some specific embodiments of the invention, reference being made to the accompanying drawings in which:

 Figure 1 is a perspective view of a tripod for
25 mounting a film or video camera having legs which are extendible in two stages;

 Figure 2 is a detailed view of a joint between two components of one of the legs including a locking
30 device for locking the components in a required position of adjustment;

 Figure 3 shows the components of a clamp in accordance with the invention for telescopically
35 connecting one leg component comprising an outer pair of parallel tubes telescopically with another leg

component comprising an inner pair of parallel tubes;

Figure 4 shows a modified version of a similar arrangement;

5

Figure 5 is a similar view to Figure 1 showing the clamp of the invention applied to another form of tripod; and

10

Figures 6 and 7 show a lower clamp on one of the legs of the tripod in greater detail.

15

Figure 1 of the drawings shows a conventional commercial camera tripod comprising a levelling bowl 10 to receive a bearing of a pan/tilt camera mounted in conventional manner. The levelling bowl has three hinge members 11 pivotally connected by pivot pins 12 to the bowl at spaced locations around the bowl to hinge three telescopically extending legs indicated at 13 to the bowl. Each leg is formed in three components telescopically connected together and comprising an upper component indicated at 14 consisting of a pair of widely spaced parallel tubes 15 and telescopically connected by a connector/clamp 16 to an intermediate component indicated at 17 comprising a pair of more narrowly spaced parallel tubes 18. The intermediate component 17 is, in turn, telescopically connected by a connector/clamp indicated at 19 to a single oval section tube 20. The lower ends of the tubes 20 are connected to the outer ends of a three-arm adjustable spreader 21.

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Figure 2 of the drawings illustrates the connector/clamp 16 between the upper and intermediate components 13, 17 of the leg and comprises a bridge member 22 having an inner pair of bores 23 through

- 5 -

which the tubes of the intermediate leg extend slidably and an outer pair of sockets 24 in which the lower ends of the outer pair of tubes 15 of the upper component are secured by adhesive.

5

A clamp 25 locks the upper and intermediate components of the leg together in any required position of adjustment. The clamp comprises a base 26 having a spaced pair of downwardly facing sockets 27 in which the upper ends of the parallel tubes 18 of the intermediate leg 17 are secured by adhesive to fasten the clamp to the upper end of the intermediate member. The clamp has a pair of parallel bores 28 through which the parallel tubes 15 of the upper component 14 of the leg are slidable.

As best seen in Figure 3, the clamp further comprises a pair of C-shaped clamping jaws 30 to receive and engage the parallel tubes 15. The jaws are interconnected by a bridging member 31 mounted on base 27 and with which one jaw of each C-shaped member is integrally formed to support the jaws spaced apart across the base with the open sides of the jaws facing towards each other. The other jaw of each C-shaped clamp has an outwardly projecting lug 32 and a clamping member 34 engages with the lugs 32 and is engaged by an adjustable rotary clamping device indicated at 35 mounted on the base. Rotation of the clamping device in one direction draws the clamping plate 34 towards the base and thereby closes the C-shaped jaws onto the tubes passing through the jaws to lock the clamp to the tubes. Rotation of the device in the opposite direction allows the jaws to open from the tubes under the inherent resilience of the jaws to allow the tubes to slide through the jaws for adjustment of the tripod legs.

It will be noted that the wall thickness of the C-shaped jaws reduces away from the open side of the jaws towards the location where the jaw is connected integrally to the bridging member 31. Thus the maximum flexing in the wall of the C-shaped member occurs in the region near the bridging member and this provides a very rapid closure of the jaw onto the tube with the minimum amount of torque required.

10

In a further arrangement illustrated in Figure 4 of the drawings, the C-shaped jaws are separately mounted on the base, one being fixed to the base and the other being free to float over a limited movement with respect to the base towards and away from the other jaw to accommodate slight out alignment in the parallel tubes as they slide through the clamp to avoid binding of the tubes in the clamp.

20

The arrangement of Figures 5 to 7 is generally similar to that described with reference to Figures 1 to 4 of the drawings except that the single oval section tubes forming the lower most members of the legs are replaced by a pair of parallel tubes 40 which are telescopically engaged in the parallel tubes 18 of the intermediate legs above. In this arrangement the base 26 of the clamp 25 has sockets 27 in which the lower ends of the tubes 18 are secured and the C-shaped clamping jaws mounted on the base engage around the parallel tubes 40 of the lowermost leg member to lock the leg member in relation to the intermediate leg member 17.

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CLAIMS:

1. A clamp for an extending leg comprising a
5 base for mounting on one part of the leg a pair of
resilient C-shaped clamping jaws mounted on the base
with the axes of the jaws spaced apart parallel to
one another to receive a pair of parallel circular
10 cross-section members forming another part of the leg
and means on the base acting on the jaws to close the
jaws around the members to grip and lock the clamp to
the members.

2. A clamp as claimed in Claim 1, wherein the
15 C-shaped jaws are mounted on the base with the open
sides of the Cs facing towards each other along the
base.

3. A clamp as claimed in Claim 2, wherein the
20 C-shaped jaws are connected together by a bridging
member mounted on the base.

4. A clamp as claimed in Claim 3, wherein one
end of each of the C-shaped jaws is formed integrally
25 with the bridging member.

5. A clamp as claimed in Claim 4, wherein the
other end of each C-shaped jaw has an outwardly
projecting lug and said means to close the jaws acts
30 on the projecting lugs.

6. A clamp as claimed in claim 5, wherein a
device is mounted at the centre of the base between
the jaws including a clamping member for engaging
35 said lugs of the C-shaped jaws and means to draw the
clamping member towards the base and thereby to close

the jaws on the leg members.

7. A clamp as claimed in any of Claims 4 to 6, wherein the wall thickness of the C-shaped jaws
5 reduces towards the regions of the jaws adjacent the bridging member to increase flexibility in those regions whereby the jaws are more readily closed on members extending through the jaws by the action of the clamping member on the jaws.

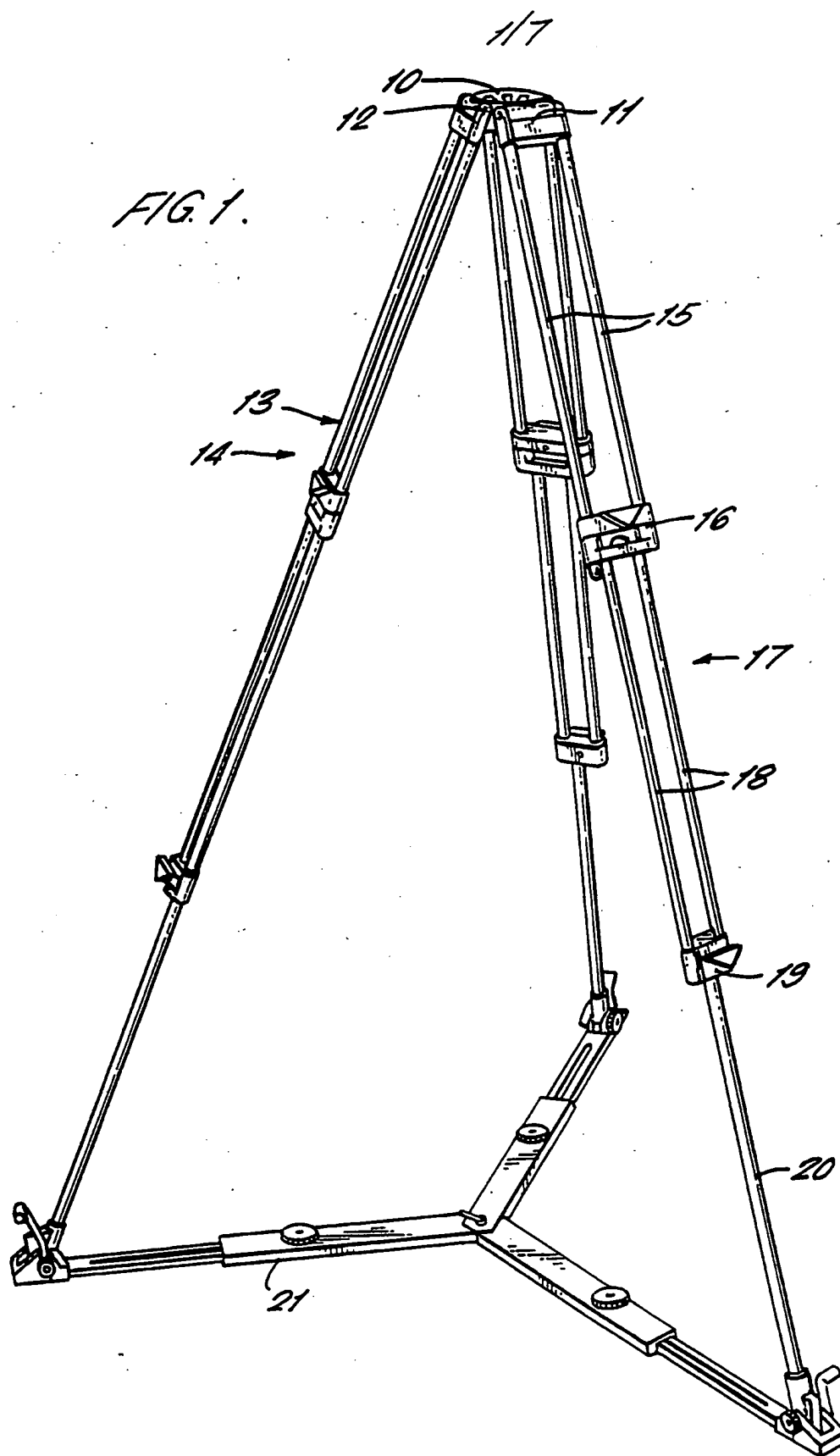
10 8. A clamp as claimed in Claim 1, wherein one of the jaws is fixed on the base and the other is free to float over a limited range of movement with respect to side one jaw to accommodate non-alignment
15 in the members passing through the jaws.

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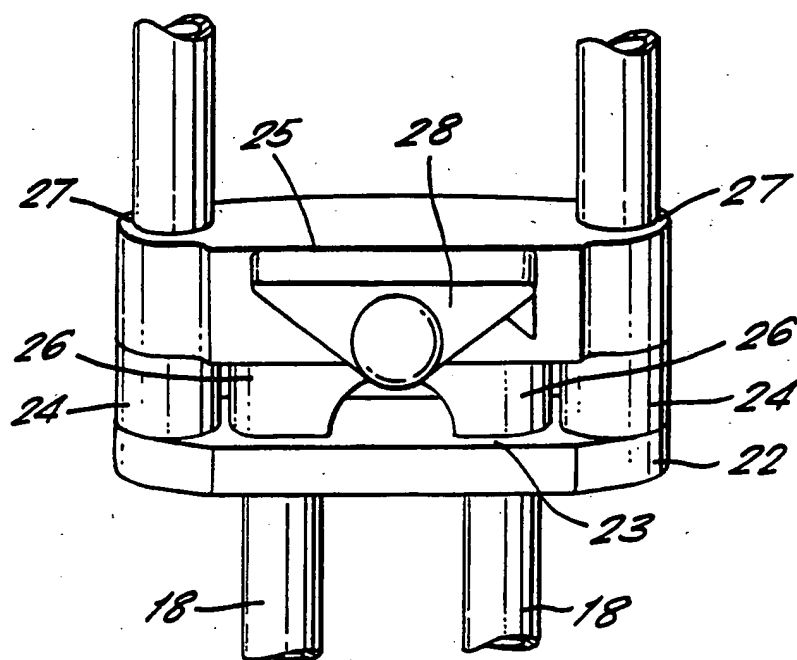
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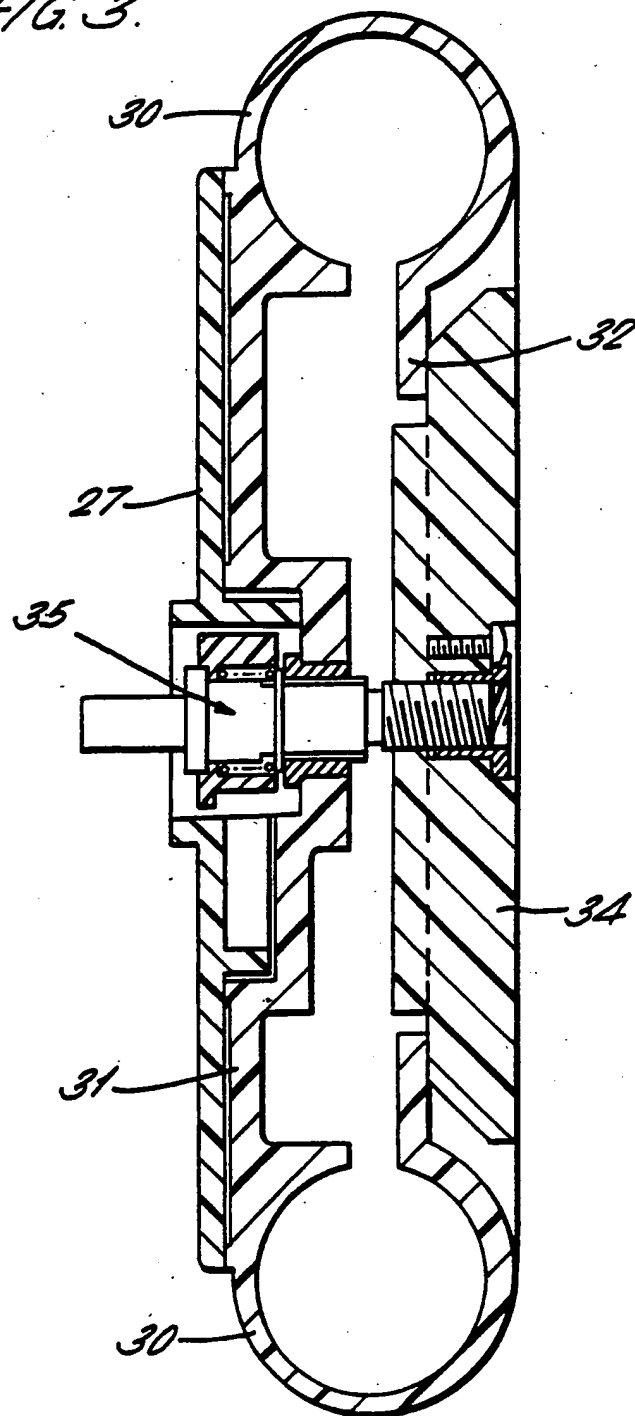
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FIG. 2.



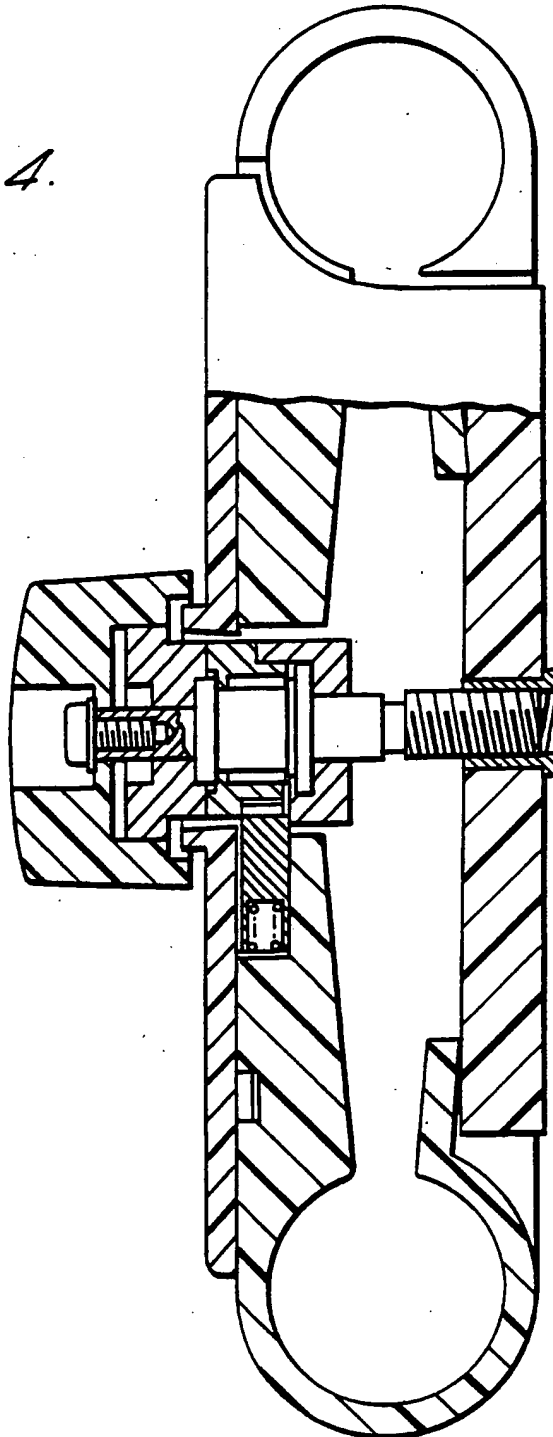
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FIG. 3.



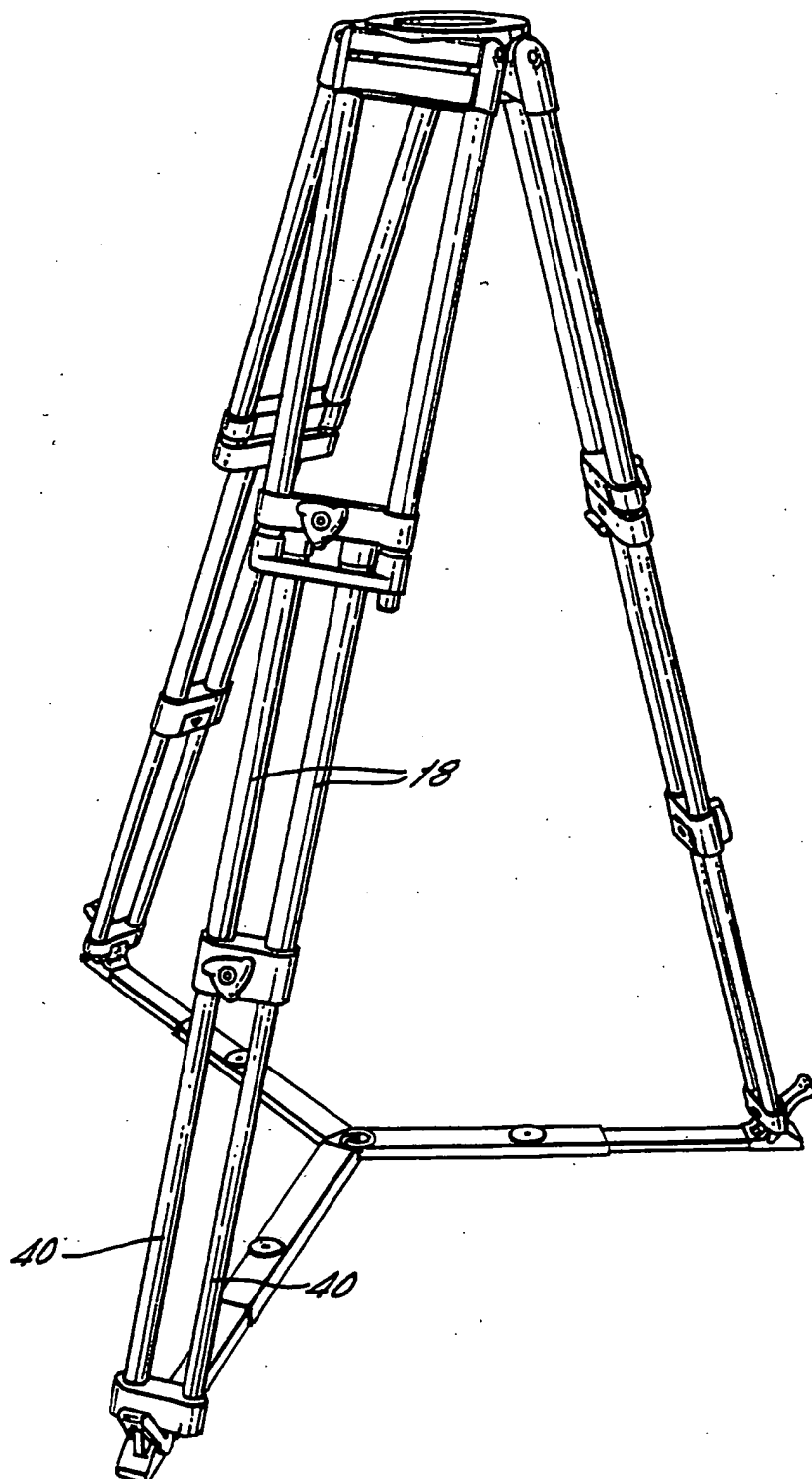
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FIG. 4.



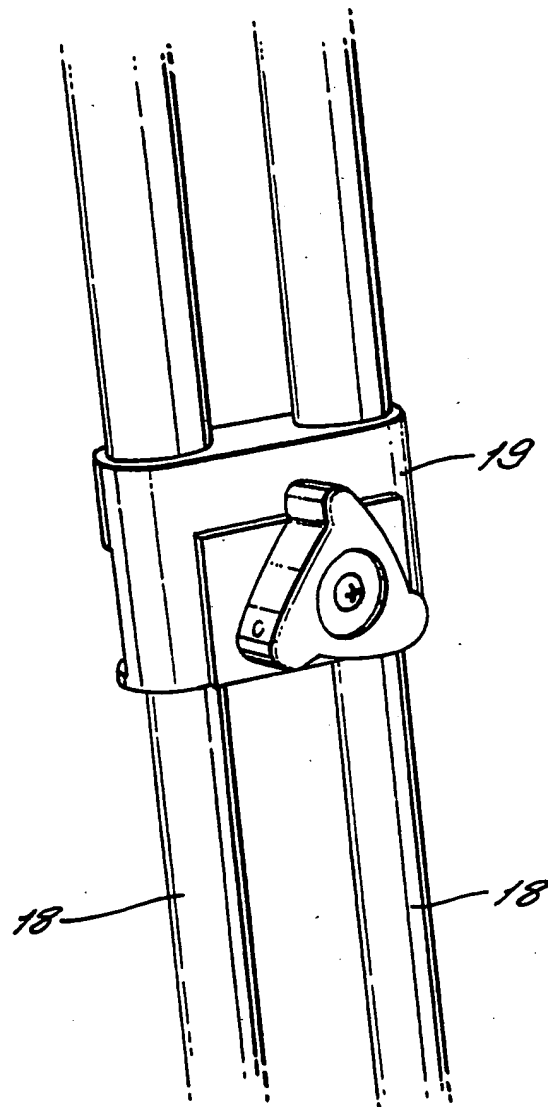
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FIG. 5.



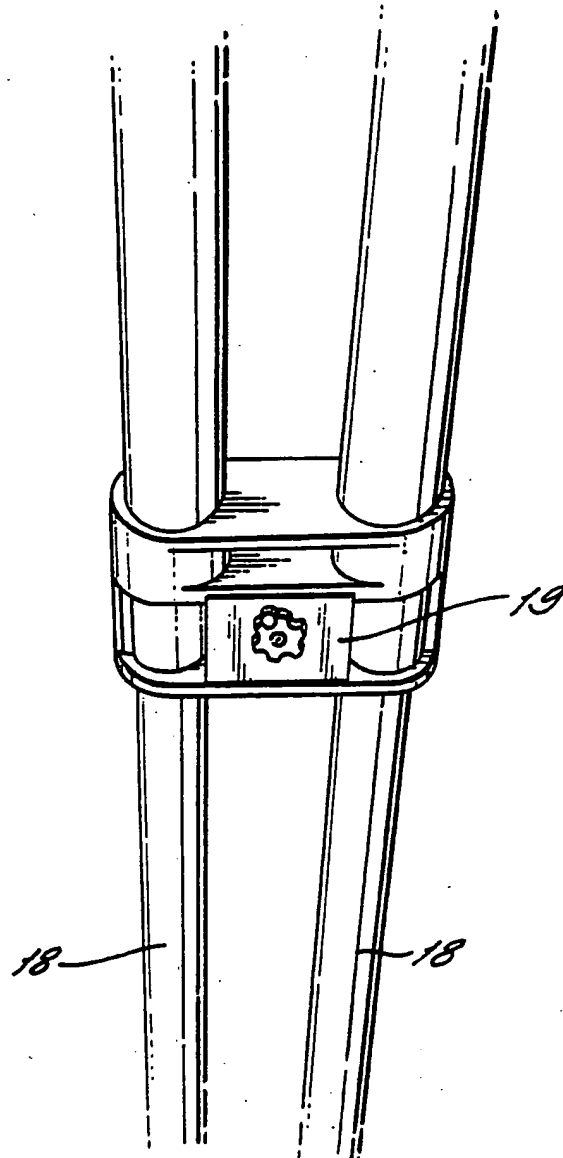
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FIG. 6.



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FIG. 7.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 92/02302

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁹ According to International Patent Classification (IPC) or to both National Classification and IPC Int.C1.5 F 16 M 11/32																	
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; border-bottom: 1px solid black; padding: 5px;">Classification System</td> <td style="border-bottom: 1px solid black; padding: 5px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">Int.C1.5</td> <td style="padding: 5px;">F 16 M F 16 B</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched⁸</div>			Classification System	Classification Symbols	Int.C1.5	F 16 M F 16 B											
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Int.C1.5	F 16 M F 16 B																
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black; padding: 5px;">Category⁹</th> <th style="width: 70%; border-bottom: 1px solid black; padding: 5px;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 20%; border-bottom: 1px solid black; padding: 5px;">Relevant to Claim No.¹³</th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">DE,A,3441225 (GROSCHUPP) 15 May 1986, see page 8, line 1 - page 9, line 3; figures 1,2,5 ---</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,3,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">DE,A,3405144 (SCHEIBEL) 22 August 1985, see page 11, lines 3-18; figures 1,8 ---</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,3,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">---</td> <td style="text-align: center; vertical-align: top; padding: 5px;">6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">P,A</td> <td style="padding: 5px;">GB,A,2246600 (VINTEN) 5 February 1992 (cited in the application) -----</td> <td></td> </tr> </table>			Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	DE,A,3441225 (GROSCHUPP) 15 May 1986, see page 8, line 1 - page 9, line 3; figures 1,2,5 ---	1,2,3,4	Y	DE,A,3405144 (SCHEIBEL) 22 August 1985, see page 11, lines 3-18; figures 1,8 ---	1,2,3,4	A	---	6	P,A	GB,A,2246600 (VINTEN) 5 February 1992 (cited in the application) -----	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>⁹ Special categories of cited documents : ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> </div> </div>																	
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="text-align: center; padding: 5px;">16-03-1993</td> <td style="text-align: center; padding: 5px;">15. 04. 93</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; padding: 5px;">EUROPEAN PATENT OFFICE</td> <td style="text-align: center; padding: 5px;">H. Baron</td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	16-03-1993	15. 04. 93	International Searching Authority	Signature of Authorized Officer	EUROPEAN PATENT OFFICE	H. Baron							
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GB 9202302
SA 67529

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 3441225	15-05-86	None	
DE-A- 3405144	22-08-85	None	
GB-A- 2246600	05-02-92	AU-A- 8180991	02-03-92
		WO-A- 9202756	20-02-92